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THE TREATMENT OF PLEURAL AND PULMONARY SUPPURATION

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It is our intention to discuss briefly some of the more modern methods that have developed during the past few years in the treatment of acute empyema, lung abscesses and bronchiectasis. No reference will be made to the treatment of tuberculous empyema or of chronic nontuberculous empyema.

During the past seven years at the Rhode Island Hospital and the Charles V. Chapin Hospital 180 cases of acute empyema, 102 cases of lung abscess and 65 cases of bronchiectasis have been treated. Since we are dealing with a large number of cases of this type it is fitting that we occasionally take stock of our results and our methods of treatment.

Acute Empyema

To consider first the problem of empyema. You are all familiar with the great advances that were made and the improvement in mortality that followed the experiences of the last World War. During the war period, the death rate in some of the Army camps reached the appallingly high figure of 65% or more. This occurred following the so-called influenzal type of pneumonia. The gross mortality for all cases in our series is 16%. The great lesson that was learned as a result of the war experience was in knowing more definitely the proper time for drainage. Today we approach the subject with a great advantage over surgeons of that time to whom we must give credit for having solved this most important problem for us. Up until this time too little attention was paid to the physiology and mechanics of respiration, and drainage of the chest before mediastinal fixation had occurred subjected the patients to the adverse effects of atmospheric pressure which in turn resulted in mediastinal flutter and subsequent death from asphyxia.

Having passed this milestone we may now proceed with some of the other problems of therapy. The discussion of the type of drainage, whether it be open, closed, or drainage by aspiration has to a large extent quieted down. This is due to a realization that every case with this disease should be approached with an open mind and no thought of predetermined measures. Our cases have been treated by all three methods. It may be said that each method has advantages and disadvantages and it should also be noted that the same destination may be reached by the traveling of different roads. Our main object is to get the patient well but today our ambition should go beyond this point and this should be accomplished as quickly and with as little discomfort to the patient as possible.

Aspiration: Treatment by aspiration is used chiefly as a preliminary to surgical drainage and in the occasional case results in cure, but on the whole this method fills a very small place in the actual treatment of empyema. Indeed overindulgence in this method has been distinctly harmful and has resulted in prolonging the convalescence of those that ultimately come to surgery, or chronic empyema has resulted which has rendered plastic operations necessary in order to achieve final cure. Its obvious advantage lies in excluding atmospheric pressure from a chest which is not prepared for it and at the same time infected fluid is removed. The disadvantage lies in the fact that drainage is inadequate in most cases, and it may be stated now that adequate drainage is the most important of all the rules that govern the treatment of this disease. It is at once obvious that pus that has become thick and in which organized fibrin is present can never be adequately drained by means of a needle. If during the course of aspirating thinly infected fluid for the purpose of relieving toxic absorption the empyema becomes cured, naturally no further drainage is indicated, but it is my belief that this occurs so rarely and that surgical drainage is necessary so constantly that as soon as infected fluid is diagnosed this is a signal for close cooperation between the surgeon and the internist. We have been very fortunate in having had this close cooperation between our services at the Rhode Island Hospital and we do not now have the experience of having these cases dumped in our laps after prolonged medical attempts to cure them.

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Closed Drainage: The same considerations that have been spoken of in treatment by aspiration apply to a certain extent to treatment by closed drainage, although it should be stated at once that this latter method fills a much larger place. The same advantages apply here but in addition it is obvious that drainage is being carried out through a larger opening and that it is constant. Closed drainage may be instituted quite readily at the bedside in those patients that are too ill to be moved. Many variations of apparatus have been suggested, the most common being by a simple catheter connected to a closed bottle. The disadvantage of this method has always been the difficulty of maintaining a closed system and the prevention of leaking after the first few days. It also requires more personal attention on the part of the surgeon. A third disadvantage is that frequently the opening is not large enough for adequate drainage.

I would like to bring once more to your attention the advantages of the two tube method in carrying out closed drainage. This was described in a previous article[1] about three years ago but is not in general use. The purpose in the treatment of any empyema is the disinfection of the pleural cavity and the re-expansion of the lung. When drainage is carried out by means of a single catheter the negative phase is lost as soon as fluid is introduced through the catheter for the purpose of irrigation but by using the two tube method lavage of the cavity is carried on continuously and the negative pressure is maintained at a constant level. The degree of negative pressure is increased or decreased by the simple expedient of lowering or raising the drainage tube. A special tube has been devised but it is also possible to carry out this method in other ways. From personal observation over several years it is our belief that this method results in convalescence being very definitely shortened. It is one of the few means by which an open drainage can be converted into a closed system, in those cases where lung re-expansion is proceeding too slowly.

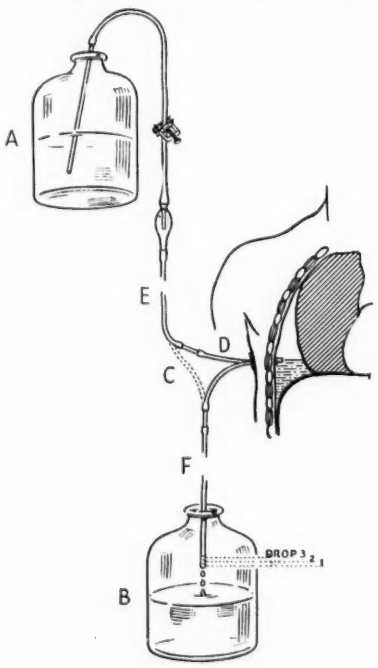

FIG. I

Diagram illustrating the continuous suction-irrigation system of closed drainage. Lavage is carried out continuously and negative pressure constantly maintained. It is increased or decreased by lowering or raising the tube F. No airtight bottles are required.

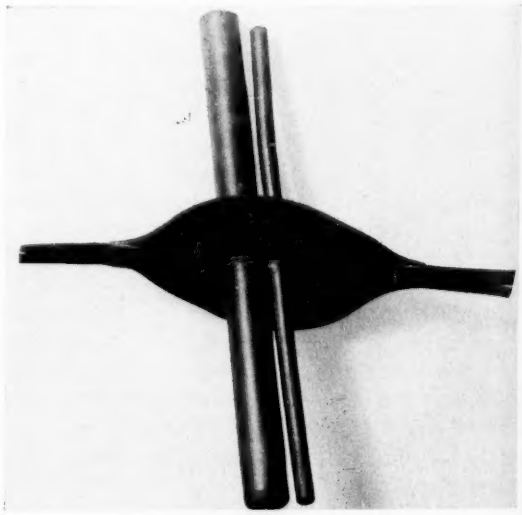

FIG. II

The type of tube recommended for suction irrigation. The portion within the chest should be cut to the appropriate length. The smaller tube is connected to the irrigating tube and the larger one to the drainage tube.

Open Drainage: Open drainage is the simplest method of all and for this reason alone has many advantages over other methods. It is the general experience that the path of least resistance is the one most generally followed and that a method that requires more time and personal attention

rarely develops into general usage. Open drainage is more easily taken care of on a surgical ward than either of the other two methods. It is applied to cases of encapsulated empyema and may also be employed where a free empyema is present which, however, has had enough pleural reaction to produce mediastinal fixation. We have occasionally been misled on this latter point and if any undue embarrassment occurred on opening the pleural cavity have resorted to the use of the special empyema tube to institute closed drainage.

The disadvantage of open drainage in addition to the above is that as a general rule re-expansion of the lung occurs more slowly and convalescence is more prolonged. We believe that flutter valves if properly applied are of definite value in aiding expansion but have not been particularly impressed with the use of blow bottles or other respiratory exercises.

The time for removal of the tube should perhaps be mentioned although it should be obvious that as long as an infected cavity remains the tube should never be removed since the sinus closes rapidly and may leave a residual empyema which may necessitate a second drainage operation. This tube should never be removed until the space has been completely obliterated unless a catheter is being inserted every day or two for the purpose of irrigation.

The diminishing size of the cavity should be determined by actual measurement or by the introduction of an opaque solution followed by x-ray. Ordinary x-ray plates give a very poor indication of the extent of the cavity.

One of the fundamental principles in the treatment of empyema is that drainage should be at the most dependent point of the cavity. In many cases it is impossible to determine this by means of x-ray alone and a very valuable method for determining this point for drainage is the introduction of lipiodol[2] and allowing it to fall to the bottom of the cavity after which antero-posterior and lateral over-exposed x-rays are taken with the patient in the upright position. This tells us whether the lowermost point of the cavity is anterior, lateral or posterior and marks the level very definitely. However, the pleura should not be opened even after having been guided by this method without having first carried out aspiration through the intercostal space or through the posterior periosteal

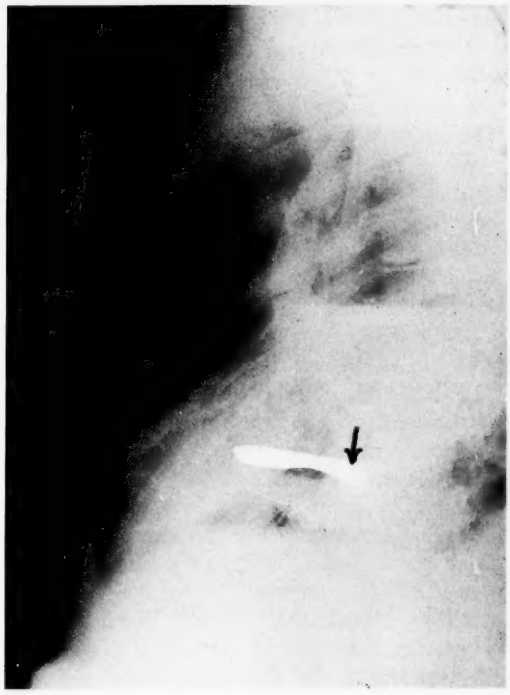

FIG. III

X-ray showing lipiodol at the most dependent point of an empyema cavity.

rib bed. If for any reason after opening into the empyema cavity it is found that the dependent point has not been reached the drainage site should be immediately changed, either by enlarging the incision downwards or if the point is too far away, by a second incision.

The type of solutions used for irrigation purposes in my experience play a very minor role except for the use of Dakin's solution during the early phase for the dissolution of organized fibrin. The sulfonamide group of drugs in concentrated solutions have been used with no apparent increased benefit. The presence of the high concentration of these drugs in the pleural fluid after ingestion by mouth has in our experience had little effect in inhibiting the development of empyema. They should be used, however, in cases where the residual pneumonia has not completely cleared or when positive blood stream cultures are still present.

Time does not permit a discussion of multiple empyema in one or both chests but in general the same principles that have been mentioned in single empyema can be applied.

Lung Abscess

It will be seen that the advances in the treatment of lung abscess have in many ways paralleled that of empyema. In the first place emphasis has again been placed on the time factor, but whereas in the former disease the tendency has been against too early drainage, in lung abscess it has been in the opposite direction. Following the lead of Neuhof[3] surgeons have definitely shown that delay in operation and allowing the abscess to reach a chronic state has been responsible for the high mortality of the past. This was emphasized by Cutler and Gross[4] in 1934 when they reported a mortality of 45% in a study of 47 cases. It has been demonstrated that in lung abscess adhesions to the parietal pleura occur early and that the abscess may be drained from 3 to 6 weeks from the onset of the disease. This improvement in mortality appears to be demonstrated in our own series in which the gross mortality for the 7 year period to the end of 1940 was 30% but in the final year the mortality was 13% in the 12 cases treated. We feel so confident that adhesions will be found in the early stage of the disease that when the nonadherent lung is encountered we are certain that correct localization has not been made. In other words there would appear to be little if any indication for the two-stage procedure.

In the second place, as in empyema, more emphasis has been placed upon accurate localization. If too casual consideration is given to this factor it will in many cases lead to unfortunate results. Attempts will be made to drain the abscess through healthy lung tissue and cases of simple abscess will be converted into putrid empyema with bronchial fistula. These as well as other calamities, which will have an adverse effect upon end results, will inevitably occur if sufficient attention is not paid to careful localization of the disease at the time of operation.

The approach to a large cavity can be made with ease, but unless great care is taken a small abscess with atypical x-ray findings will tax every means at our disposal. X-ray although many times inadequate in itself is still our most valuable aid. It may be necessary to take films in various positions — anteroposterior, posterior-anterior, lateral and oblique. By the use of these films the abscess is localized beneath its overlying rib and the rib selected is reached at operation by carefully counting from below upward posteriorly and from above downwards anteriorly. The selection of the segment for removal is not always easy and it is not uncommon to find oneself too far medial or too far lateral. If nonadherent pleura is encountered at this point an x-ray taken immediately will correct our position, since the rib defect acts as an excellent guide. In these more difficult cases Rabin[5] has suggested injecting lipiodol mixed with lamp black into the intercostal bundle. This is done while visualizing the abscess under the fluoroscope.

X-rays are then taken and the opaque lipiodol tells us whether or not the injection corresponds with the position of the abscess and the dye is the guide to be followed at operation. We have employed this method with some success and believe it should come into more general use.

The approach to the pleura should be made with extreme care. If after incision through the post periosteal bed and the endothoracic fascia the characteristic porky indurated pleura is observed, an aspirating needle is used for the first time. It need hardly be stated that needling of a lung abscess previous to operation for the purpose of localization or diagnosis should not be done under any circumstance and at operation it is rarely necessary to insert the needle more than ½ to 1 inch through the pleura before obtaining the characteristic foul air or pus.

The abscess having been located the treatment of it at operation deserves some comment. In general it has been our policy to exteriorize rather than to be content with drainage alone. This applies especially to those cavities in which we find rigidity of the abscess wall. In order to accomplish that it may be necessary to remove sections of as many as three ribs. The external surface of the cavity is excised and thorough inspection carried out. All necrotic tissue is removed and communicating cavities searched for. It is usually wise to resect the ribs well beyond the area of the abscess, especially the larger ones, in order to allow for moulding of the soft tissues of the chest wall. We have never found it necessary to resort to the use of pedicle flaps, as recommended by Gurd[6], for the obliteration of the cavity space. Plain gauze is packed loosely into the cavity after sprinkling the surface with sulfathiazole and sulfanilimide crystals. The

wound is left open except for silk sutures through the skin at its angles.

It has been our policy routinely to remove a section of the cavity wall for pathological study in order to determine the degree of chronicity and to observe the subsequent course in relation to this factor.

The operation is carried out under local anesthesia and should cause no discomfort to the patient whatsoever, nor should it produce any operative reaction. On returning to the ward the patient's condition should be the same as when he left it before the operation.

Bronchiectasis

The improvements in the treatment of bronchiectasis have coincided with the improved surgical technique in dealing with intra-thoracic disease. This refers especially to the improved methods of performing lobectomy and pneumonectomy. In addition to surgical technique the cooperation with the internist, bronchoscopist, roentgenologist and anesthetist has also been responsible for the improved results in bronchiectasis. The anesthetist has perhaps contributed more than the others. All our cases have been carried out under cyclopropane using an intratracheal tube with an inflatable cuff. This anesthesia in addition to its other advantages gives us a high oxygen concentration which allows for quiet breathing, and secretions which are usually troublesome in these cases can be readily aspirated from the bronchial tree, thus keeping the lung dry and preventing spilling. After the tube is removed at the completion of the operation a more thorough aspiration is carried out through the bronchoscope.

With regard to improvements in surgical technique it may be stated that the operations for this disease are approached with much more confidence than they were in the past. Experience has taught us that these patients withstand surgery well if all the rules are carefully followed. There is not the urge to race through the operation in order to get the patient off the table that charcterized these operations in the past. On the other hand the time element should be kept in mind for as has been pointed out by many writers the incidence of postoperative pulmonary complications varies directly with the duration of operation after a certain point. The freeing up of troublesome adhesions is done carefully by sharp dissection and all trauma and bleeding is carefully avoided. In lobectomy it is important that the lung should not be kept collapsed for a long period and it has been our practice to re-expand the lung about every twenty minutes during the course of the operation in order to lessen the danger of pulmonary complications.

The most important contribution to the technique during the past few years has been the introduction of individual ligation for both lobectomy and pneumonectomy, although, in the latter case, it has been used over a longer period especially when dealing with malignant disease. Although it is not possible in every case, the ligation of the individual structures at the hilum is a much more satisfactory and a more surgical procedure than the use of a mass ligature and the ability to deal with the bronchus as a single structure and to be able to obliterate it with multiple sutures has cut down the number of bronchial fistulae, and diminished the incidence of pleural infection. The usual course of these cases today is that of a smooth postoperative convalescence but naturally this varies with the type and extent of the pathology and the condition of the patient in general.

Other advances are in the wider range of operability and it has been demonstrated that a patient with two good upper lobes may successfully have the other three removed. The tendency is also away from the two stage procedure and it is unusual to consider it in the average case, although occasionally the problem of expansion of the upper lobe may still be a troublesome factor.

X-ray treatment for bronchiectasis in our experience has been of little or no value. It certainly should be used only in those cases where surgery for any reason is contraindicated. Bronchoscopic lavage may give temporary relief of symptoms but it is doubtful if it has ever resulted in cure.

REFERENCES

1. Beardsley, J. Murray: The Treatment of Acute Empyema, Surg., Gynec., & Obst., 65:685-687, 1937.

2. Suggested by Clarence E. Bird.

3. Neuhof, H., and Touroff, A. S. W.: Acute Putrid Abscess of the Lung. Principles of Operative Treatment, Surg., Gynec. & Obst., 63:353, 1936.

4. Cutler, E. C., and Gross, R. E.; Nontuberculous Abscess of the Lung, J. Thoracic Surg., 6:125, 1936.

5. Rabin, Coleman R.: Precise Localization of Pulmonary Abscess, J. Thoracic Surg., 10:6:662-671, 1941.

6. Gurd, Fraser B.: Pulmonary Abscess, J. Thoracic Surg., *2*:1-20, 1941.

HYPERTENSION

Experimental Aspects

MORGAN CUTTS, M.D.

Modern experimental work on hypertension was given a fresh start by Goldblatt's method of producing hypertension in animals. He showed in 1934 that by partially clamping the renal arteries in the dog, a type of hypertension could be produced resembling essential hypertension; that is, with no elevation of nitrogenous products in the blood, or any gross derangement of the kidneys' excretory function. It had previously been assumed that "renal" hypertension was due solely to the piling up of waste products in the blood which the kidneys were unable to excrete. Another explanation of Goldblatt's results might be thought to be a reflex vasoconstriction, initiated by the ischemic kidney and brought about by nervous control of the arterioles elsewhere throughout the body—as if in an effort to overcome the lack of blood supply to the affected kidney. This hypothesis has been definitely proven untrue. Complete denervation of the kidney, the adrenals, and paravertebral sympathectomy, that is, severing all the nervous pathways which could be concerned in such a reflex, have been shown to be ineffective in reducing the hypertension after it has been produced or in altering its subsequent production. Even when a kidney is transplanted into the neck or the groin, free from all its original nervous connections, and with a new blood supply, hypertension can be produced by partial interruption of this blood supply by a Goldblatt clamp. The third possibility of a humoral mechanism being the one involved remains as the most likely. According to this theory a substance is elaborated in the ischemic kidney which is absorbed in the blood stream and produces the vasoconstriction responsible for the hypertension. As long ago as 1898 German investigators described a pressor substance in extract of kidneys which they called Renin, which produced a rise in blood pressure when injected into animals. More recently it has developed that extract of damaged or ischemic kidneys is more effective in this respect than that of normal ones. Also, it can be demonstrated that if blood perfusing an ischemic kidney enters the circulation of a normal dog it produces a rise in blood pressure. Goldblatt has recently shown that after applying his clamps to the renal arteries, hypertension results only if the venous channels from the kidney are left open.

Thus, it can be said with reasonable certainty that this type of hypertension results from the elaboration of a pressor substance in the ischemic kidney. But other ways of producing permanent hypertension in experimental animals have been reported. Chief among these is one developed abroad and recently revived and reported on by Grunison. It involves the section of certain nerves in dogs; the nerves from the carotid sinuses on both sides and the cardio-aortic depressor nerves which run with the vagi. One function of these nerves is to lower vasomoter tone in antagonism to the vasoconstrictor activity of the sympathetic system. Hypertension produced by section of these nerves can be partially cured by extensive sympathectomy. It therefore seems that a "neurogenic" as well as a "renal" type of experimental hypertension must be admitted, though its validity is more often questioned than that produced by the Goldblatt method.

A further development of the "renal" type of hypertension has resulted in the work of Page, and of Grollman and Harrison, on possible anti-pressor substances. Renin has already been mentioned as the substance present in kidney extracts and especially in ischemic kidneys which produces vasoconstriction and a rise in blood pressure. Whether renin is directly responsible, or whether it is renin plus renin-activator resulting in "angiotonin" as Page believes, is immaterial to the present discussion. In any case there is increasing evidence that this pressor substance is normally antagonized by an anti-pressor substance also elaborated by the kidney. Let us review this evidence briefly. First, Renin produces a greater blood pressure rise in nephrectomized than in normal animals. By itself, of course, nephrectomy does not produce hypertension. Similarly, if one kidney is made ischemic and a hypertension results, removal of the normal kidney makes the hypertension worse. Blood coming from an ischemic kidney has been shown to have blood pressure raising properties. Such blood entering the circulation of a nephrectomized dog produces a greater rise in blood pressure than in the case of a normal dog. All these facts indicate that the presence of normal kidney substance acts as a counter balance to the type of hypertension we are discussing. Page concludes that such normal kidney substance elaborates an anti-pressor substance. He also believes he can demonstrate this

anti-pressor substance in normal blood by various kinds of experiments such as the fact that large transfusions of normal blood lower the blood pressure of hypertensive dogs. Page has worked solely with an extract of kidneys designed for parenteral use. These extracts were tried on both dogs and humans. In hypertensive dogs, where the extract was given in moderate daily doses, the fall in blood pressure was gradual, reaching normal in five to eight days. If the treatment was discontinued the pressure returned to normal. Unless shock was induced by the use of massive doses no general reactions and few local reactions occurred, (in dogs). In dogs with a "malignant syndrome" the B.U.N. fell, and eye ground changes (hemorrhages) regressed.

In patients (19 in all) there was a reduction of blood pressure to near normal in 17 following treatment with the extract. Vision improved with regression of retinal changes in the "malignant hypertension" cases.

Though reactions occur, probably due to impurities, these are not directly related to the fall in blood pressure Page believes. The nature of the active substances in the extract has not been exactly determined, but it seems unlikely that it is merely a toxic by-product acting directly, for it produces no effect in normal animals, and it does not resemble any of the common groups of drugs known to lower blood pressure. The treatment is, of course, still in the experimental stage. Grollman & Harrison, working with an oral kidney extract, apparently similar to that of Page, also produced a fall in blood pressure in hypertensive dogs and in a limited number of patients with hypertension.

Application of the neurogenic theory of hypertension has been carried forward by two or three groups of investigators, notably those working with Adson and others at the Mayo Clinic. These workers apparently base their treatment on an effort to create a large splanchnic reservoir to absorb large blood volumes and prevent rises in pressure. Of the surgeons, Peet comes nearest to combining the renal and neurogenic theories of hypertension. His operation, bilateral section of the three splanchnic nerves and removal of the sympathetic chain of ganglia from the tenth down to the diaphragm, is based by him on the assumption that the cause of essential hypertension is abnormal nervous constriction of the blood vessels of the kidney, and he operates to remove the "nervous clamp" on the renal arteries. At the same time he diminishes the peripheral blood volume by splanchnic dilation and also diminishes adrenal function by the denervation.

In reviewing these conflicting reports one fact seems clear, that there is increasing emphasis on the role of the kidney in the production of hypertension. Hypertension cannot be produced by clamps on any arteries but the renal. The fact that a definite pressor substance and possibly an anti-pressor substance in the kidney has been demonstrated and that all successful surgical procedures involve a changed nerve and perhaps a changed blood supply to the kidney are also supporting evidence. However, there are many discrepancies in all these theories. Although the Goldblatt clamp is an effective means of producing hypertension in the dog certainly no such anotomical obstruction is present with any regularity in human cases. Blackman and others have found at autopsy that a large percent of cases of essential hypertension show narrowing of the main renal arteries, but this might have been the result and not the cause of long standing hypertension. Against the theory of the "nervous clamp" on the renal arteries is the failure of denervation of the kidney by itself to affect the hypertension of human subjects. It may be that a variety of causes, sometimes more than one in the same individual, are operative. The main line of attack for future work seems to be centering more and more on the kidney; on the exact nature, mode of production and action of the pressor substance and of the still debated anti-pressor substance, and also on the mechanism by which the various operations bring about a lowering of blood pressure.

155 THAYER ST.

HYPERTENSION

Surgical Treatment

ROBERT R. BALDRIDGE, M.D.

The subject under discussion tonight is of more than academic interest. I sometimes think that hypertension is so common that physicians are apt to ignore its seriousness. According to statistics of the Metropolitan Life Insurance Company, 15% of all adults have high blood pressure, and 23% of all adults who reach the age of 50 years will die with hypertension or one of its sequelae.

In order to keep the record straight, I want to emphasize the fact, mentioned by Dr. Cutts, that Goldbladt was able to produce experimental hyper-

tension in dogs only if he applied his clamps to *both* renal arteries. The application of a clamp to one renal artery did not produce permanent hypertension unless the opposite kidney had been removed. From this the deduction has been drawn that the opposite normal kidney produces an anti-pressor substance. This theory has not been definitely proven. (Might it not be that a toxic substance elaborated by the ischaemic kidney on one side is simply excreted by the normal kidney on the opposide side?)

Dr. Goldbladt's experiments have been of tremendous importance, not only in elaborating a possible mechanism in the formation of one type of high blood pressure, but also in stimulating a general interest in this subject. I think, however, that his experiments, emphasizing as they do the effect of pressure on the large renal artery, may have perhaps carried our minds away from the smaller but perhaps equally important arterioles of the kidney parenchyma. Pressor substances might be elaborated following partial obstruction of microscopically small arteries or arterioles, just as by the compression of the larger renal arteries. As has been mentioned by Dr. Cutts, Page has produced experimental hypertension by cellophane peri-nephritis.

While extensive denervation does not relieve or prevent the hypertension produced with the Goldbladt clamps, it is important to remember that *removal* of these clamps does cause a reduction of the high blood pressure to normal levels, except in cases where they have been in place for such a long time that irreparable damage has been done. It does not appear to me to be reasonable to expect any nerve operation to eliminate the deleterious effects of a mechanical obstruction while that obstruction is still in effect. Only the removal of such a clamp, whether it be mechanical on a large artery, or possibly neurogenic on many smaller arteries, could be reasonably expected to alleviate renal ischaemia and its consequences.

The surgical approach to hypertension is based upon the known fact that hypertension is accompanied by an increased peripheral vascular resistance. In Raynaud's Disease the associated vascular spasm can be relieved by an appropriate neurectomy. Spinal anaesthesia can and often does reduce the blood pressure in hypertensive as well as in normal subjects. It, therefore, seemed reasonable to attempt to produce a permanent fall in the blood pressure of hypertensives by interference with the nerve control of their blood vessels. This operative manoeuvre has been attempted by various courageous men. Adson, of the Mayo Clinic, originally did an extensive rhizotomy, removing the anterior nerve roots from the sixth thoracic to the second lumbar vertebrae. While the operation appeared to be moderately successful, it was too extensive for general application, and the same author subsequently developed the sub-diaphragmatic resection of the splanchnic nerves and the first and second lumbar ganglia. He reports reasonably good results in properly selected cases.

Dr. Peet accomplishes a denervation of the splanchnic area by operating *above* the diaphragm. This operation includes the removal of the greater, lesser, and least splanchnic nerves and the thoracic ganglia from the tenth to the twelfth. Both of these surgeons have as the object of their operations an extensive denervation of the blood vessels below the diaphragm. However, since the upper lumbar ganglia are not removed through the supra-diaphragmatic approach, and since the adequate and complete removal of all contributing nerve fibers from above the diaphragm is difficult if not impossible in the infra-diaphragmatic approach, it is probable that neither of these two operations completely denervate the splanchnic bed.

To Dr. Smithwick goes the credit for combining these two operations. He uses a sub-diaphragmatic approach, follows the lumbar chain upward *through* the diaphragm into the chest and removes all afferent sympathetic nerve fibers to the semilunar ganglia. His operation, if successful, causes such an extensive relaxation of the blood vessels in the splanchnic area that postural hypotension is a prominent feature of the immediate postoperative convalescence in his patients.

Extensive sympathetic splanchnic denervation is associated with a dilatation of all vascular channels below the diaphragm which are capable of relaxation. Judging from the immediate cessation of sweating and the dilatation of the peripheral vessels, one may readily see how the blood supply to the kidneys and the adrenal glands may also be improved. In addition to this possible effect of the operation, it should be remembered that the adrenal glands are also incidentally deprived of their nerve supply and are no longer directly connected with the sympathetic nervous system. Since it is known that the suprarenal glands are essential to the Goldbladt type of experimental hypertension, the fact that they are denervated in this type of operation may be of some significance.

Concerning the indications for surgery in hyper-

tension, I can only say that I personally believe that individuals with grades three or four hypertension, particularly those below 50 years of age, should not be deprived of this form of treatment, especially if adequate medical therapy has proven ineffectual. Various pre-operative studies, such as the "cold-pressor test", and the sodium amytal test, etc. have not, in my experience, proven reliable in prognosticating surgical results.

Contra-indications to surgery include a failing myocardium or renal suppression. Previous cerebral accidents and extensive eye-ground changes do not contra-indicate surgical therapy.

I would like to urge that malignant hypertensive cases be accurately diagnosed and vigorously treated by medical means, but that these patients be given an opportunity for surgical procedures before irreparable damage has occurred in the brain, the myocardium, or the kidneys. Certainly it is true that the medical man cannot reasonably expect a high percentage of cures if he is not willing to recommend surgery before irreparable organic changes have taken place.

Results of surgery depend on the stage and malignancy of the disease; also, very definitely, upon the thoroughness with which all afferent nerves to the great sub-diaphragmatic sympathic ganglia are removed. Satisfactory falls in blood pressure which persist for months and years should be expected in over 50% of cases. Relief of headache, chest pain, eye-ground exudates, etc. occurs in many patients who do not show persistent falls of blood pressure. This fact is of great importance to the patient, and should be to his physician.

The mortality rate is below 5%. The operation, in properly selected cases, is surprisingly safe and innocuous. While it may not always relieve the hypertension or the symptoms, it never, in my experience, has done the patient any harm.

In conclusion, may I present three cases operated by me, and showing fairly satisfactory falls in blood pressure and relief of symptoms. These patients are present tonight, and you may feel free to examine or question them.

May I emphasize the fact that not all operative results are as satisfactory as those here presented. One reason is that as yet we have no satisfactory method for selection of cases; another is that I have operated only upon the more malignant and hopeless types of cases; and finally, I believe that the Smithwick operation, which I now employ, is more effective than that of Adson, which I used in my earlier operations.

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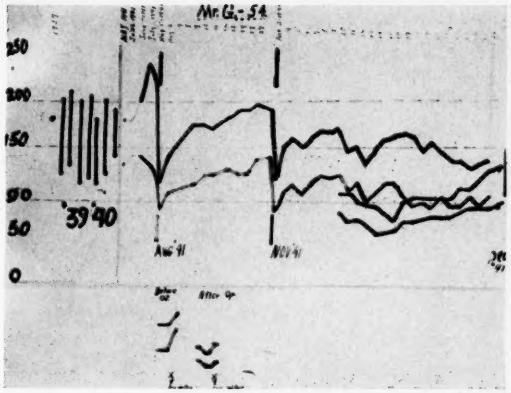
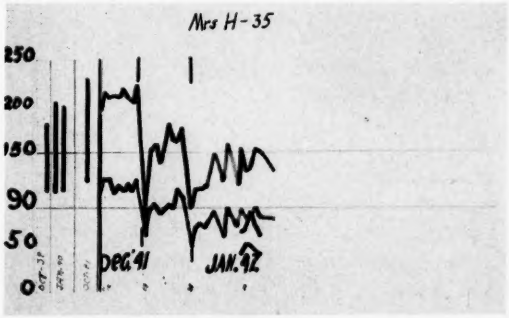


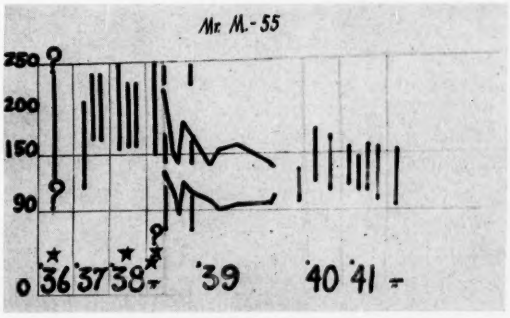
CASE I

Mr. G — 54 years. Operations in August and November 1941.
Present blood pressure 135/95
Response to cold pressor test recorded at bottom—much reduced. Converging lines toward end of chart represent pressures in recumbent and upright positions.



CASE II

Mrs. H — 35 years. Operations in December 1941 and January 1942.
Present blood pressure 135-160 systolic,
70-95 diastolic.



CASE III

Mr. M. — 55 years. Operations in May and June 1939
Cerebral accident 1936
1 perforation peptic ulcer (operated) 1938
1 perforation peptic ulcer (operated) 1939
1 threatened perforation 1939
Intense headache completely relieved by operation.
Present blood pressure 135-155 systolic,
90-100 diastolic,

HYPERTENSION

Medical Aspects

CLIFTON B. LEECH, M.D.

One reason for the interest of surgeons in hypertension is the failure of medical treatment to control the disease adequately. This failure is admitted by all and the contribution which surgical research is making in the effort to master this disorder is welcomed. If it becomes well established that the treatment of choice is surgical the enthusiastic cooperation of the medical man is assured. Medicine is searching for the truth that it may put it to use.

Several authors, like Scupham[1], state that "rest, sedatives, toxic depressants et cetera have failed to cure or arrest the progress of" hypertension. With this I do not agree but there is no proof one way or another. Proof might consist of a large series of medically supervised and treated patients over a period, let us say, of 30 years, compared to a similar group of untreated hypertensive patients. Can any experienced physician doubt what would be the result of such a comparison? Every doctor must have had under his care hypertensive patients who responded very well to medical management, in some of whom the pressure levels became normal; and others who, though hypertensive, lived usefully and comfortably to advanced ages. On what basis can it be said that medical therapy did not influence favorably the course of the disease? That sometimes there is a rapidly progressive unfavorable course, and that occasionally there are distressing and uncontrollable symptoms are regrettable truths.

The Nature of Clinical Hypertension

Why are there such variations in the disease and in the response to therapy? This question can be briefly answered best perhaps by listing some of the current ideas about the nature of clinical hypertension. It is generally agreed that hypertension ordinarily develops and progresses through three stages;

1) the pre-hypertensive stage during which there is elevation of blood pressure as a transitory phenomenon during periods of stress or as the result of some pressor agent;

2) a stage during which the pressure is elevated under most of the circumstances of life but diminishes under the influence of relaxation and sleep and the administration of drugs;

3) a stage with relatively fixed pressure levels which may be lowered somewhat as the result of therapy and management but in which organic arterial changes have occurred.

Malignant hypertension is held[2] to be a phase which occurs after a prolonged period of high diastolic pressure which is thought to produce acute damage to arterioles and elevation of cranial pressure with concomitant symptoms of headache, et cetera and papillidema.

Other authors[3] think that malignant hypertension is a syndrome which may occur

(a) with no evidence of previously existing hypertension

(b) as the end stage of essential hypertension with or without uremia

(c) as the end stage of a miscellaneous group of conditions

"Since malignant hypertension is a syndrome and not a specific type the renal pathological findings will show a wide variation from patient to patient. The prognosis is almost always poor but remissions do occur and may last as long as eight years."

A survey of the international literature and the results of original work led Raab[4] to the conclusions that essential hypertension can be caused by three pathogenic factors: *1*) vaso-constriction due to hormonal effects upon peripheral vascular tonus, caused by hyperactivity of the adrenal cortex and the suprarenal glands; *2*) vaso-constriction due to increased central vasomotor tonus and irritability, caused by arteriosclerotic ischemia of the cerebral medullary vasomotor centers; *3*) vaso-constriction due to the formation of vaso-pressor substances in the kidneys caused by arteriosclerotic ischemia of the kidney tissue. There is a very close causal relationship between these three factors.

Among various classifications of clinical hypertension, the best in my opinion is that of Soma Weiss[5] which in itself is sufficient to explain the variations in the course of and responses to treatment of the disease. This classification is as follows:

I. Hypertension of organic vascular origin, with renal ischemia.
   1. Congenital malformations.
      a. Coarctation of the aorta.
      b. Hypoplastic renal artery.
      c. Polycystic kidneys.
   2. Inflammatory vascular diseases.
      a. Glomerulonephritis.
      b. Pyelonephritis.
      c. Periarteritis nodosa.
      d. "Rheumatic" arteritis.
      e. Disseminated lupus erythematosus.

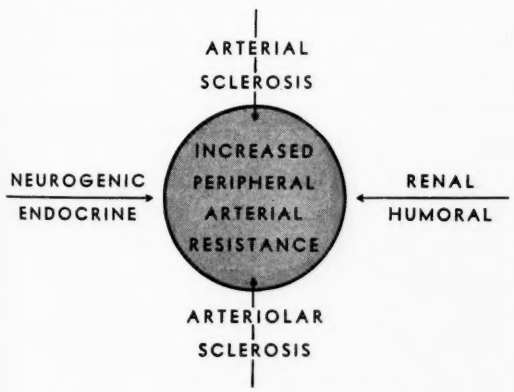
3. Degenerative vascular diseases.
   a. Arteriosclerotic occlusive lesions of the renal artery (essential hypertension).
   b. Renal arteriolosclerosis.

II. Hypertension of organic vascular origin, without renal ischemia (diffuse arterial and arteriolar sclerosis).

III. Hypertension of nonorganic vascular origin.
1. Endocrine disorders.
   a. Pituitary dysfunction and neoplasms (Cushing syndrome).
   b. Adrenal dysfunction and neoplasms (cortical and medullary).
   c. Certain types of toxemia of pregnancy.
2. Nervous disorders.
   a. Cerebral trauma.
   b. Cerebral neoplasms.
   c. Poliomyelitis.
   d. Rare vascular diseases of the brain.

"This classification does not include the secondary factors that accentuate hypertension — that is, emotions, complete heart block, aortic insufficiency and so forth. Carotid-sinus reflexes, bichloride of mercury, lead, tobacco, alcohol, syphilis, hydronephrosis, prostatic obstruction, spinal bladder and infarcts of the kidney are not considered *primary* causative factors of hypertension."

From these and other sources which time does not permit us to present it is possible to arrive at a concept of hypertension which can be presented in a simple diagram.



Herein are represented the four major primary etiologic factors which cause increased peripheral arterial resistance, at first by spasm alone, later by the production, at greatly varying rates of speed and to greatly varying degrees, of arterial and arteriolar sclerosis with more or less fixation of the hypertension.

There is no uniformly effective single treatment for hypertension. Medical therapy aims at preventing and decreasing the increased peripheral arterial resistance and is therefore directed not only at the primary agencies but also at the modification of vaso-motor sensitivity and the control of emotional factors. The ways and means of doing this, of getting the patient to relax and to avoid harmful stimuli, the use of sedatives and vaso-dilators, often with great benefit, are too well known to warrant discussion at this time.

Thiocyanate Therapy

A form of treatment about which the following was written as late as September 1941[6] deserves consideration; "another procedure which is more conservative than surgical treatment and which if properly employed will give as good if not greater and more persistent effects than surgery is thiocyanate therapy."

The pharmacology of the cyanates is very little understood[7]. Claude Bernhardt reported the first observations in 1857 and regarded them as a muscle poison which abolished muscular activity. The first observation that the oral administration of thiocyanate decreased arterial pressure in hypertension was made by Pauli in 1803[8]. The drug probably accumulates in the adrenal gland. Results of experiments on normal dogs, ischemic hypertensive dogs and normal dogs with elevated blood cyanate levels indicated that the effects on the blood pressure are a result of a general vasodilatation[9]. This effect can be increased by removal of the thoracic sympathetic trunks and splanchnic nerves supradiaphragmatically. It has been observed that in many patients who responded poorly to cyanate therapy there is a good response after bilateral splanchnicotomy.

Very recently a number of excellent reports of thiocyanate therapy in hypertension have appeared. One of these was by Massie[6] of St. Louis who eliminated the psychotherapeutic effects of therapy by a carefully controlled method of study. Over one-half of the patients so treated had marked reduction of systolic and diastolic pressure levels and symptomatic relief, particularly that of hypertensive headache.

Barker, Lindberg and Wald of Chicago[10] reported in the Journal of the American Medical Association for November 8, 1941 the data on 246 patients who have been on continuous closely controlled thiocyanate therapy for intervals ranging

from 2 to 10 years and state that blood pressure can be reduced and symptoms alleviated in more than 50% of patients with hypertension provided that the criteria for adequate cyanate control are observed. The criteria of cyanate response used by them are; *1*) general clinical improvement; *2*) a substantial reduction in blood pressure, 30 mm. to 60 mm. systolic and 20 mm. to 30 mm. diastolic, associated with *3*) a blood cyanate concentration of from 8 to 12 mg. per 100 cc.

They have employed thiocyanate in the treatment of hypertension under the following circumstances; *1*) when the other clinical measures have failed, *2*) when excessive sedation is necessary to control symptoms and *3*) after surgical treatment which has been unsuccessful.

In general they begin treatment by giving .3 gm. of potassium thiocyanate daily in either liquid or tablet form. Blood cyanate determinations, by a modification of Schreiber's technique, described by Barker in 1936, are taken at weekly intervals for from 4 to 6 weeks. The dosage is decreased if the blood pressure drops sharply during the first 2 weeks of treatment or if symptoms of fatigue and depression interfere with the patient's sense of well-being. The dosage may be doubled during the second or third week if the blood concentration has not reached the level of 6 mg. per 100 cc., if there has been no blood pressure change and if there are no toxic symptoms. The dosage may be constantly varied depending upon the symptoms, the pressure levels and the blood level concentration. The drug appears to be most effective in a concentration in the blood of 12 mgs. per 100 cc. Improvement is expected in a few weeks but persistent therapy for about three months may be required though an occasional patient will show no response after several months of continuous therapy. As a rule symptoms of fatigue, somnolence and mental retardation are often met during the first few weeks but are not necessarily indications for discontinuing therapy; these symptoms usually disappear entirely after 4 to 6 weeks of continued treatment. Caution must be exercised in patients with poor renal function and in those with advanced arteriosclerosis on account of the theoretical danger of a rapid fall in blood pressure resulting in vascular occlusion. The best clinical results have been obtained in patients with hypertension whose erythrocyte count is normal or high, whose sedimentation rate is slow and whose blood pressure may be shown to be labile. Little or no benefit has been obtained in severe hypertension with fixed blood pressure levels.

Other authors have mentioned minor toxic symptoms which consist principally of weakness, aches in the legs, epigastric distress, nausea, nervousness, mild dermatitis and decreased libido.

My personal experience with potassium sulphocyanate has included several score of patients during the past 5 years; these have not been statistically analyzed or compared with a control group nor have I made use of the blood cyanate level determinations, due to lack of facilities for this procedure, and therefore I have not given the drug in as large dosage as have the authors quoted given to some of their patients. Generally speaking I have found .3 to .6 of a gm. daily in divided doses to be notably effective in about one-half of the patients treated. I have never seen any serious toxic effects but have been obliged to withdraw the drug on account of nausea, nervousness and weakness.

Surgical Therapy

Since the object of all treatment of hypertension is the same it becomes important to decide which patients shall be treated medically and which by surgery. Perhaps we may be influenced in our decision by what the surgeons themselves say. Rytand and Holman[11] of San Francisco, state in the Archives of Internal Medicine for January 1941, in connection with the observation of 20 patients who underwent section of the splanchnic nerves and removal of 3 pair of thoracic ganglions; "in general the results were poor. In only one patient was there a brilliant result although in 5 others there was some degree of success in reduced blood pressure. Six more patients felt better but their arterial pressures were not lowered. In 9 patients there was no change. Eleven died within a year and a half, transient relief of symptoms appearing in 5 of these."

Bartels, Poppen and Richards[12] of Boston reported in the Lahey Clinic Bulletin for January 1942 their experience with 54 patients with hypertension who have been treated by surgery of the sympathetic nervous system which they state may have an ameliorating effect upon the blood pressure of patients with essential hypertension. Their best results were obtained in patients with moderate to severe hypertension whose ages were less than 40

years and whose blood pressure responded to sedation. Symptomatic improvement was found to occur in 71% of the patients; in one-half of these the blood pressure remained elevated. They state, "this operation, we believe, is justified when patients fulfill the criteria which we have selected for the procedure and when they understand that satisfactory lowering of the blood pressure is obtained in about one-third of the cases."

Woods and Peet of Ann Arbor[13] reported in November 1941 on 76 consecutive patients with essential and malignant hypertension who were operated on by bilateral supradiaphragmatic splanchnicectomy and lower dorsal ganglionectomy and were followed from 5 to 7 years. They conclude that: *1*) the prognosis of patients with a high level of blood pressure and angiospatic changes of the arterioles is much more effective following operation than following medical treatment; *2*) the surgical treatment of patients with malignant hypertension has resulted in a survival of 33% after 5 years, whereas following medical treatment in the control series the mortality was more than 99%; *3*) in general, favorable prognosis following operation seems to depend on a minimal degree of retinal arteriolarsclerosis rather than on the level of the blood pressure, etc.

Scupham[1], reporting in the Archives of Internal Medicine for September 1941 quoted Peet's, Woods' and Braden's[14] report on 350 patients with extensive operations which resulted in significant reduction of the blood pressure in 51%, with relief of major symptoms in 85%, with the most favorable results in the age group below 30, and with a surgical mortality of 3.4%. Allen and Adson[15] are reported as employing a somewhat different procedure of supradiaphragmatic splanchnic nerve section with partial resection of the upper two lumbar sympathetic ganglions; they report on 224 patients with about the same results as quoted above. They state that while sympathectomy is somewhat disappointing in the production of permanent reduction of blood pressure yet the relief of symptoms with extension of life expectancy justifies the surgical procedure.

Smithwick[16] describes an extended splanchnic nerve section which probably amounts to a practically complete splanchnic denervation while Grimson, Alving and Adams[17] report a more radical operation which amounts to a total sympathectomy. Heinbecker[18] explains the symptomatic relief on the basis of adrenal denervation.

Crane[19], of California states that, "surgery attempts to decrease arteriolar resistance by denervation of the splanchnic area, the renal vessels and kidneys, and the adrenal glands together with a large part of the lower extremities by the subdiaphragmatic operation. That it has done so has been demonstrated in many cases." His criteria for operation, like those of other surgeons, are: *1*) no response to competent medical treatment, including sulphocyanate therapy; *2*) 50 years of age or under, *3*) no marked arteriosclerosis as determined by eye-ground findings; *4*) minimal amount of kidney damage; *5*) labile blood pressure. In regard to results he states, "measured by blood pressure levels the results are inconsistent. Measured by clinical symptoms the results are excellent."

These reports illustrate the point which I wish to make, namely, that the various operations have tended to prevent symptoms rather than to affect the fundamental and underlying causes. For the most part there is no claim that neurosurgery does more than prevent the various pressor agencies from producing their effects: this seems to be the fundamental difference between it and medical treatment which, theoretically at least, attempts also to eradicate these agents, and which is conducting very promising experimental work. I wish to quote a paragraph written by a man who though not a surgeon must certainly be regarded as an outstanding authority in the study of hypertension. The following was published by the late Soma Weiss[5] of Boston in December 1940. "If one recalls the number of claims and counterclaims as to the efficacy of the numerous types of neuro-surgical procedures ever since Pieri in 1932 resected both splanchnic nerves in patients with essential hypertension, one wonders about the effectiveness of these measures. Volini and Flaxman, impressed by the observation that the majority of proposed therapeutic measures have a brief popularity and then pass into obscurity, undertook a comparative evaluation of the results of nonspecific surgical measures (hysterectomy, cholecystectomy and prostatectomy) and of specific neurosurgical operations (extensive sympathectomy, splanchnic nerve resection and celiac ganglionectomy). The authors followed the effects of fifty-two operations on hypertensive patients and concluded that any of the

claims made for the efficacy of specific operations can likewise be made for nonspecific surgical measures. Obviously, then the value of neurosurgical treatment of hypertension is not yet established." I do not interpret this as a condemnation of surgery in hypertension but as the author's opinion, only 14 months ago, that its true value was not clear and its place not well defined.

What Treatment Shall be Selected?

It appears that the kind of patient *desired* by the surgeon is the one who does well, usually, under medical treatment; if I were such a patient I would not want performed on me the extensive operations described unless medical management had failed. At the present time when there is no agreement as to the exact etiology of hypertension; when it appears there are several mechanisms which can function, separately or in unison, to produce the syndrome; when the precise manner in which surgery relieves (when it does relieve) is not understood; when the effects of operation are largely in the relief of *symptoms* rather than the removal of causes; when the *ultimate* effects of extensive sympathectomy are not known; when there is no agreement among the surgeons as to the best operative procedure; when due to lack of knowledge, it is not possible to select a particular operation for a particular patient, but when all types of hypertension are treated more or less alike by the individual surgeon; and when, in other words, the surgery of hypertension is in the experimental stage, there is left for surgery, in my opinion, that group of patients who show progressive hypertensive disease in spite of adequate medical treatment and that small group of patients who have symptoms, due to the hypertensive state, which cannot be subdued by medical means and which can be abolished by severing nerves.

What will be the future treatment of hypertension? From the collective evidence presented it seems likely that medical treatment of hypertension will become increasingly effective as the practical application of the experimental studies becomes available, that the humoral type of anti-pressor substance obtained from animals or synthetically produced, will play an important, perhaps a revolutionary, part in the control of the syndrome; that failures will occur for which surgery will be needed, and that the indications for surgery will become sufficiently well defined to allow the selection of patients on an established basis. If it becomes certain that the treatment of choice is surgical the enthusiastic cooperation of the medical man is assured. Medicine is searching for the truth that it may put it to use.

BIBLIOGRAPHY

1. G. W. Scupham—Report on Surgical Treatment of Hypertension under Progress in Internal Medicine—Archives of Internal Medicine, September 1941.
2. W. W. Hamburger—Treatment of Hypertension—Medical Clinics of North America *25*, January 1941.
3. H. A. Derow and M. D. Altschule—The Nature of Malignant Hypertension—Annals of Internal Medicine *14*, April 1941.
4. W. Raab—The Hormonal, Central and Renal Origin of Essential Hypertension—Annals of Internal Medicine *14*, May 1941.
5. Soma Weiss—Report on Medical Progress, Arterial Hypertension—New England Journal of Medicine, December 1940.
6. Edward Massie—Newer Aspects of Thiocyanate Therapy in Hypertension—International Clinics, September 1941.
7. M. H. Barker—The Blood Cyanate in The Treatment of Hypertension—Journal American Medical Association, March 7, 1936.
8. M. H. Davis and L. Barker—Depressor Effect of Potassium Sulphocyanate—Journal of Laboratory and Clinical Medicine *26*, January 1941.
9. W. L. Ritter—Selection of Hypertensive Patients for Treatment with Thiocyanates—Journal of Missouri Medical Association, 1941.
10. M. H. Barker, H. A. Lindberg and M. H. Wald—Further Experiences with Thiocyanates—Journal American Medical Association, November 8, 1941.
11. D. A. Rytand and E. Holman—Arterial Hypertension and Section of the Splanchnic Nerves—Archives of Internal Medicine, January 1941.
12. E. C. Bartels, J. L. Poppen and R. L. Richards—Surgical Treatment of Hypertension—The Lahey Clinic Bulletin, January 1942.
13. W. W. Woods and M. M. Peet—The Surgical Treatment of Hypertension—Journal American Medical Association, November 1941.
14. M. M. Peet, W. W. Woods and S. Braden—Surgical Treatment of Hypertension: Results in 350 Consecutive Cases Treated by Bilateral Supra-diaphragmatic Splanchnicectomy and Lower Dorsal Sympathetic Ganglionectomy—Journal American Medical Association *115*:1875, November 30, 1940.
15. E. V. Allen and A. W. Adson—Medical Versus Surgical Treatment of Hypertension—Annals of Internal Medicine *14*:288, August 1940.
16. R. H. Smithwick—A Technique for Splanchnic Resection for Hypertension—Surgery *7*:1, January 1940.
17. K. S. Grimson, A. S. Alving and W. Adams—Experiments and Clinical Basis for Total Bilateral Paravertebral Sympathectomy in Essential Hypertension, read at the meeting of the Central Society for Clinical Research, Chicago; November 2, 1940.
18. P. Heinbecker—Role of Surgeons in Problems of Essential Hypertension in Relation to Splanchnic Section—Annals of Surgery *112*:1101, December 1940.
19. W. Crane—The Surgical Treatment of Essential Hypertension—California and Western Medicine *54*, March 1941.

82 WATERMAN ST.
PROVIDENCE, R. I.

THE RHODE ISLAND HOSPITAL'S ARMY UNIT

ERIC STONE, M.D.

In February 1940 the Surgeon General of the Army requested the Board of Trustees to organize what he designated as the 48th Evacuation Hospital by interesting members of its staff in volunteering for such service. The board promptly accepted the invitation and appointed a committee to carry out the plan. Dr. Charles Gormly was appointed "Unit Director" with Dr. Albert A. Barrows and Dr. Bertram Buxton as the other members of the Committee. Their problem was the procurement of four non-medical administrative officers and thirty-two doctors. The sixty needed nurses are being enrolled by the local Red Cross.

Two factors made the work of the Committee difficult. It had to be careful to recruit men in such a way that mobilization would not cripple any of the Rhode Island Hospital's services. In the second place the nature of the proposed army hospital was such that many doctors who wished to join the army hesitated to submerge their special skills in the rough and tumble of such a unit.

An Evacuation Hospital, at least according to the "Military Medical Manual" appears to be a hybrid offspring born of the union of an operating floor and a travelling circus. It is designed and equipped to be either set up or taken down within twenty-four hours for movement forward or back with fluctuations in the position of the combat zone. It functions in buildings temporarily pressed into such service or in the tents and marquees which it carries in its train of trucks. Its X-Ray department, laboratory and sterilizing equipment, for example, are in specially designed trucks.

Through its mobility it constantly maintains a position from 8 to 16 miles from the front, well in the combat zone. The Medical Regiment brings the casualities to the Evacuation Hospital from front line Assembly Points. The Evacuation Officer and his staff determine the severity of the injury or illness. Patients who can stand the trip to the nearest rail heads are immediately sent to the rear in the hospital's fleet of ambulances. The others, requiring emergency surgical, shock or medical treatment are sent to the appropriate team for immediate care and remain in the hospital until they can safely be transported to the Base Hospital. The hospital can normally accommodate 400 such patients.

For many months the response scarcely warranted the efforts of the Committee; but the shock of Pearl Harbor gave such point to its appeal that within a couple of weeks it had filled the complement of medical officers. This consists of two lieutenant-colonels, the chiefs of the surgical and medical services. There are five official surgical teams, which in a pinch can split up into twice that number. On paper at least each is made up of an operating surgeon, an assistant operating surgeon and a surgical assistant, ranking respectively as major, captain and lieutenant. The medical service also has one major, two captains and three lieutenants. A captain heads the "Shock Team" and another the "Splint Team". The anaesthetists are under the orders of a captain. There are two roentgenologists, a captain and a lieutenant and two dentists of similar ratings. The laboratory is in charge of a captain.

The organizational work is completed. The original committee, with the approval of the Board of Trustees, has surrendered its task to one made up of officers of the unit. This committee will carry on certain administrative and contact duties until the hospital is called for duty when a Colonel from the regular Army Medical Corps will take command. The non-commissioned officers and enlisted men will also be provided from the regular army. With these, nurses, administrative officers and doctors, the entire personnel will number 417.

There is no way of knowing when the 48th Evacuation Hospital will be mobilized; but apparently the need for such units is great. Up to January of this year 70 existed on paper of which about a dozen are now in service and last month the formation of 40 more was authorized. This leads the members of this outfit to hope that it will be called before their enthusiasm can be cooled by too long a period of expectant waiting.

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Boerhaave . . . reflects with just severity upon those arrogant philosophers, who are too easily disgusted with the slow methods of obtaining true notions by frequent experiments, and who, possest with too high an opinion of their own abilities, rather chuse to consult their own imaginations, than enquire into nature, and are better pleased with the charming amusement of forming hypotheses, than the toilsome drudgery of making observations.
Dr. Samuel Johnson.

KEEPING INFORMED

Alert physicians engaged in organizing medical services for total war are hungry for up-to-the-minute information as to how to deal efficiently with present day emergency problems. Modern warfare and modern medicine are changing with such rapidity that the doctor must continually adapt his thinking and planning to these changes if he is to be at all useful. Arm chair philosophies and fond reminiscenses of limited personal experience in past wars may be a diverting pastime to some but are hardly vital to vigorous preparation for the present emergency. Rhode Island physicians have recently enjoyed an opportunity of learning firsthand of medical experience in a country which has already felt the physical impact of war. It is to be hoped that medical plans in our own country will reflect the practical experience of those who have actually dealt with medical problems under active war conditions.

Nearly two hundred Rhode Island doctors gathered at the Rhode Island Medical Society Library on March 20th, to hear Dr. James T. Heyl of Boston describe some of his experiences as a physician with an American orthopedic unit in England through the German bombings during the fall of 1940. Dr. Heyl gave a vivid and interesting description of life in England under food rationing and the black out, and went on to discuss medical activities in that country as applied to emergency condition.

In England physicians and the civilian population are thoroughly organized for dealing with the results of air raids. Apparently the unstinted use of generous transfusions for shock following traumatic injuries has become firmly established as a practical medical necessity in areas subject to bombing. The sudden and unpredictable arrival of large numbers of raid victims at casualty stations and base hospitals has necessitated that enormous amounts of stored blood, plasma, and serum be immediately available for use. Such stores have become available through an efficient and far-reaching system of collecting and storing blood taken from large numbers of the healthy civilian population. The scale on which this is carried out in England surpasses anything at present approached in any American center. An intimate acquaintance with the British method of doing this will doubtless be applicable to American communities, but a great deal remains to be done before we may have any confidence that our facilities are really adequate. In developing an organization for dealing with large numbers of raid victims, particularly those in shock, it is important that plans be worked out so that when the emergency comes everyone knows what his job is, knows where to go, and knows what to do.

An excellent example of the application of an extremely recent medical acquisition to the treatment of war injuries may be seen in the use of the placement of sulfonamides directly in open war wounds. The physical as well as the bactericidal properties of these drugs must be taken into consideration when they are used for this purpose if

results are to be properly evaluated. For example, sulfanilamide being freely soluble may disappear from the wound area soon after it is applied with a resulting elevation in the blood concentration of the drug. Sulfathiazole, on the other hand, being less soluble is more apt to "cake up" and thus be absorbed much more slowly by the body from the wound area. Which type of absorption is most desirable for various types of wound treatment has not yet been definitely established.

The number of American physicians who have actually seen service in England during periods of air raids is limited. However, these men who have had firsthand acquaintance with the practical problems involved and who are familiar with American facilities and practices should have a great deal to offer to those of us who are entrusted with developing emergency services. Physicians in this country will do well to heed the practical experience of those who have been under fire, and any intelligent development of our own organization should reflect some of their experiences. Rhode Island physicians hope for further opportunities of hearing firsthand what has been done elsewhere and what must be done in this country if organized medicine is to do its part in defensive and offensive warfare.

THE CHARLES V. CHAPIN HOSPITAL

Two acts have been introduced before the General Assembly providing for the transfer of the Charles V. Chapin Hospital from the City of Providence to the State.

Section 1 of one of the acts reads as follows:

> "SECTION 1. The city of Providence, a municipal corporation existing under the laws of the state of Rhode Island, is hereby authorized to convey to the state of Rhode Island for the consideration of $100.00, to be paid by said city to said state within six months after the approval of this act, all the land and buildings situated in said city and known as the "Charles V. Chapin Hospital," together with all property, fixtures, supplies, instruments, tools and equipment of any kind or description used in connection with the operation or maintenance of said hospital and which may be on hand or in existence at the time of any conveyance or conveyances made by virtue thereof."

The other act provides for the Governor to take the hospital over from the city next fall assuming no obligations that the city has hitherto incurred.

Apparently there is nothing in the acts throwing any light on just how the state will handle this matter after obtaining control of the hospital. The City Hospital as it was called until recent years, has been a unique institution. Down in the dingy quarters in the City Hall Providence had the remarkable privilege for well on towards half a century of possessing in its Superintendent of Health one of the most outstanding if not the greatest of Public Health workers in the world. He was a man of original ideas and the force to see them through. And in the course of his work he caused to be developed in Providence this hospital for the care of epidemic diseases according to the revolutionary ways which he proved to the world were correct. Under his supervision and the superintendency of Dr. Richardson this became the Mecca of Public Health workers and as was said by Dr. Burgess before the Providence Medical Association this week—"the farther from Providence one went the better this hospital was known." The scope of its work has expanded especially in the addition of wards for tuberculosis patients and a psychiatric ward. All these functions have been exceedingly valuable in relieving the other large hospitals of the city of types of patients they were not equipped to handle and which were decided nuisances to these institutions. A group of men have been trained in these lines of outstanding ability and many of them have stayed for years, the turnover in contradiction to many public institutions having been small. Apparently politics have played a lesser part than unfortunately they have in many departments.

Now the city has been able to extend some of its facilities to surrounding communities on the payment of proper fees and thus has broadened its scope. It has been said that some of these communities have not met their financial obligations and monies are owed to Providence which it is easily conceivable will never be paid if this contemplated change occurs.

The value of the hospital property has been estimated as about $2,000,000 which the city has paid for and this is to be given to the state (with $100 thrown in for good measure as the act now reads). Large municipalities in general seem to feel it necessary to provide themselves with this type of hospital instead of depending on the state to supply their needs.

As Providence has about 35% of Rhode Island's population it presumably under the new plan will have access to little over ⅓ of the beds and in the event of a serious epidemic the most congested area in the state will be left in the lurch. Charity is said to begin at home and a selfish attitude at least would suggest that the city should wish to have things in statu quo.

If the outside state needs more beds for contagious work it would seem logical to meet this need at Howard and psychiatric and tuberculous needs at Howard and Wallum Lake.

It has been mentioned that politics have not in the past apparently been a blight on the Chapin Hospital. It is notorious that changes in the state control have always resulted in a pretty general forced exodus of those holding jobs under the government. Who can assure us that even the present strongly established political set up may not fluctuate in the future with demoralizing effects on the healing art?

All this may sound like an argument to make no change. It is not necessarily so. But as far as Providence goes it has been blessed in the past with a wonderful municipal hospital. It is incumbent on those who propose such a radical change to justify themselves.

The Providence Medical Association at its regular meeting on April 6 passed the following resolution:

> "Whereas it has been proposed that the city of Providence transfer the Charles V. Chapin Hospital to the State of Rhode Island, and in view of the fact there appear to be medical reasons against doing this.
>
> Be it resolved that the Providence Medical Association strongly opposes this transfer on the basis of information at present available and urges further study of the entire problem prior to any such action."

A familiar phrase speaks of "open commitments openly arrived at."

It has been a pernicious custom in Rhode Island to slip bills through the legislature in the wee sma' hours without debate. Possibly the proponents of this bill have a strong case. In all fairness to the citizens of Rhode Island and the medical profession who are vitally interested there should be public hearings at which both sides can be presented and this tremendously important matter be decided on its merits.

CONFERENCE ON MEDICAL SERVICE PLANS

The first Conference on Medical Service Plans was held in Chicago on February 14, 1942, at the headquarters of the American Medical Association and the Palmer House. A total of sixty-four persons were present, including representatives from operating and proposed medical service plans in seventeen states and officers of state and county medical societies.

Dr. Olin West, Secretary and General Manager of the American Medical Association, welcomed the representatives and stated: "You are distinctly a part of a great movement that is essential to the welfare of the people of this country and it is highly desirable that you should get together to exchange information and opinions in order to arrive at a basic understanding of the problems involved."

The entire day was devoted to consideration of the basic principles and major problems involved in medical service and limited surgical benefit programs sponsored by medical societies. The following are some particularly pertinent points brought out in the discussion:

> Contract practice plans limiting service to a small number of physicians can not provide a satisfactory service for an entire community. Non-profit community-wide or state-wide service plans are the proper type of organization for prepayment of medical services.
>
> The statement that voluntary plans lead to compulsory insurance applies to the chaotic situation created by a multiplicity of lay controlled or commercial plans not to medically sponsored community programs.
>
> Experiments in the full coverage type of medical service plan are being undertaken to determine the effect of such plans on the private practice of medicine; how such plans affect the physician-patient relationship: what problems arise in connection with the practice of specialists; the difference between urban, rural, and metropolitan practice; and all general problems relating to medical care.
>
> Enrollment based on individual physical examinations does not furnish as good selection as group enrollment.
>
> The desirability of establishing somewhat uniform or model legislation for medical service plans was emphasized.

The Conference concluded with the appointment of a committee to determine the best method of establishment of a permanent organization of medical service plans throughout the country.

12th NEW ENGLAND HEALTH INSTITUTE

BILTMORE HOTEL, PROVIDENCE, R. I.
APRIL 21, 22, 23, 1942

"In Defense of Health" is the slogan of the 12th New England Health Institute which will be held at the Providence Biltmore Hotel on April 21, 22, and 23. The health departments of every New England State will collaborate in presenting the Institute. Other collaborating agencies are the U. S. Public Health Service, Children's Bureau of the U. S. Department of Labor, New England Tuberculosis Association, the R. I. Public Health Association, the R. I. Medical Association.

Dr. Thomas Parran, Surgeon General of the United States, will give the principal address at the dinner meeting on Wednesday evening, April 22.

The daily sessions, which will run from 9:30 a.m. to 12:20 p.m. and from 2 to 5 p.m., will feature public health workers of national prominence. An added feature will be a luncheon sponsored jointly by the Rhode Island Nutrition Association and the Rhode Island Dental Society at which Mark D. Elliot, D.D.S., of the Forsythe Dental Infirmary will speak on "Nutrition and Dental Health."

SCHEDULE

Cancer	Apr. 22, 2-5
Communicable Diseases	Apr. 22, 9:30-12:20
Crippled Children	Apr. 21, 9:30-12:20
Environmental Sanitation,	Apr. 22, 9:30-12:20 and 2-5, Apr. 23, 9:30-12:20
Health Education	Apr. 21, 9:30-12:20
Industrial Hygiene	Apr. 21, 9:30-12:20 and Apr. 22, 9:30-12:20
Laboratory	Apr. 21, 2-5
Maternal and Child Health,	Apr. 21, 2-5; and Apr. 22, 2-5
Nutrition	Apr. 23, 9:30-12:20
Public Health Nursing	Apr. 21, 9:30-12:20 and Apr. 23, 9:30-12:20
School Health	Apr. 22, 9:30-12:20
Tuberculosis	Apr. 21, 2-5
Venereal Disease	Apr. 22, 2-5
Vital Statistics	Apr. 21, 2-5
War Preparations	Apr. 23, 9:30-12:20
General Session	Apr. 23, 2-5
New England Water Works Association Meeting	Apr. 23, 9:30-12:20

MATERNAL MORTALITY STUDIES

A series of four round table conferences to acquaint the profession with the types of cases in which maternal mortality is apt to occur has been announced by the Committee for the Study of Maternal Mortality of the Rhode Island Medical Society. The conferences, one hour in length, will be held on Wednesdays, April 22, 29, May 6, and 13, from 11 A. M. until noon, at the auditorium of the Rhode Island Medical Library. These conferences based on an investigation of the maternal deaths in the State in 1941 are a phase of the educational program of the State Department of Health, and it is the hope of the Committee that members of The Rhode Island Medical Society and of the Providence Medical Association will attend the conferences. Each meeting will be conducted by one of the undersigned members of the Committee.

B. H. BUXTON, M.D.
J. C. CALLAHAN, M.D.
H. E. GAUTHIER, M.D.
M. GOLDBERGER, M.D.
J. W. HELFRICH, M.D.
A. W. MAHONEY, M.D.
I. H. NOYES, M.D.
J. G. WALSH, M.D., *Chairman*

CLINICAL-PATHOLOGIC CONFERENCES OF THE RHODE ISLAND HOSPITAL

CASE RECORDS AS USED IN THE BI-WEEKLY OPEN MEETINGS.

Abstract of House Record: Presented by Dr. L. C. Kingman. D. C.: A-40-265. White Male. Age 60. Fruitpeddler. Admitted on Medical Service October 22, 1940, with Chief Complaint of dyspnea.

History: There was a two-year history of progressive dyspnea. On entrance he was orthopneic and had been bed-ridden for four months. A month previous to admission had a sudden paralysis of left arm and face lasting one week. There was an electrocardiograph record of April, 1939, showing coronary occlusion.

Physical Examination: The positive physical findings on admission were enlarged heart, moist rales both bases, some edema of the ankles. Abdomen soft, not distended, no spasm, tenderness

nor masses. Liver edge just palpable. T. 97.2, P. 68, R. 20, B.P. 160/120. Urine showed trace of albumin and granular casts. Blood not remarkable except for B. U. N. of 22 and creatinine of 3.2. X-ray showed evidence of congestion and possible patch of consolidation right lower lobe. Also enlargement of the left ventricle.

Course: 2nd day—E. K. G. Considerable myocardial damage, 50 c.c. clear fluid on right chest tap. On digitalis without much change until 15th day began to vomit and this continued from then on. 21st day E. K. G. showed further myocardial damage. 23rd day E. K. G. showed further acute myocardial damage.

On this day first noted that he had severe generalized abdominal pain with tenderness and marked rigidity throughout abdomen, especially in lower half.

Surgical Consultation: Diffuse lower abdominal pain and tenderness, small amount gastric type vomitus, large amount fecal material in rectum. No evidence of localized inflammation or mesenteric thrombosis.

24th day—Surgical consultation—general tenderness to left of umbilicus. Fecal type vomiting, Miller-Abbott tube inserted.

25th day—X-ray showed "Dilatation of numerous loops of small bowel. There is evidence of intestinal obstruction." Surgical Consultation—localized tender loop of moderately distended bowel below and to left of umbilicus, also slight general distention.

26th day—increased edema of legs. Urine only 15 oz. daily. Began to be jaundiced two days ago and this has been increasing. Icteric index 35. Distention increased. Pain and tenderness persists. No pain or tenderness in R. U. Q. Hiccough present.

27th day—Surgical consultation—pain is less, jaundice deepening, persistent deep tenderness in region of pancreas and below and to the left of umbilicus. Intermittent hiccough. Bile in stools.

Transferred to Surgical Service. Operation.

28th day—Death.

Dr. Lucius C. Kingman: "In any case an intercurrent disease is possible. But unless such an intercurrent disease is obvious, diagnosis of any case should be made on the basis of a primary pathology when history, signs and symptoms are compatible with such a procedure. In the case under consideration are they compatible?

We have a patient with definite coronary heart disease as shown by history, physical and laboratory findings and the course in hospital. On the 15th hospital day abdominal symptoms begin and invite surgical interest. He starts with vomiting, thought to be due to digitalis. But when pain and tenderness develop on the 23rd day, he is seen and followed by the surgical service. His signs and symptoms progress, distention develops and finally progressively deepening jaundice. X-ray helps in the diagnosis of a definite ileus.

To list all the causes of ileus from strangulated hernia to paralytic ileus of peritonitis is useless. In many cases we cannot make a preoperative diagnosis other than intestinal obstruction. In some cases, history and findings may help in correctly estimating the cause. But when we remember the way appendicitis can imitate most any intra-abdominal lesion, that volvulus, internal concealed hernia, bands of adhesions act alike, that paralytic ileus may be obstipation of the morphine addict, we realize that without definite findings other than ileus we are guessing. If we guess often enough we will occasionally be right.

What have we in this case that can take it out of the class of guess work? First coronary heart disease with acute exacerbations. This means a probable mural thrombus in the heart with the chance of embolus. A month before hospitalization he had a cerebral accident with paralysis of left arm and face for a few weeks. This could be embolic. Then on entrance to hospital a patch of consolidatation was found in the right lower lobe of lung and 50 c.c. fluid was aspirated—this could embolic.

Next, abdominal signs, intermittent at first but progressive, vomiting, pain, tenderness, then a definite ileus. Whether fluid in the abdomen or enlarged spleen is not mentioned. This could be embolic. When we have three incidents that could be from identical cause we are getting away from coincidence or guess work.

As to the final development—jaundice. With a mesenteric embolus, venous thrombosis would occur and this could progress to include the portal vein. Also the patient had edema. And passive congestion of the liver especially in cases with emboli may give jaundice.

Diagnosis:

1) Coronary Heart Disease.
2) Cerebral Embolus.
3) Pulmonary Embolus.
4) Mesenteric Embolus (Superior Mesenteric).
5) Mesenteric Thrombosis and Portal Thrombosis.
6) Passive Congestion of liver."

Dr. Alex M. Burgess: "We think surgeons are somewhat more than medical men who are technicians. Dr. Kingman falls in this category. He has given a nice medical case with surgical discussions. I notice there is only one blood pressure noted—160/120 and left ventricle is enlarged by X-ray. We can say this man not only has arterio-sclerotic heart disease but hypertensive heart disease. Was there any leucocytosis noted in the count?"

Dr. Kingman: "The white count never got above 1100. There was nothing characteristic about either white or red counts."

Dr. Burgess: "I think there is pretty good evidence that there was hypentension."

Dr. Russel O. Bowman: "At what period was his creatinine determined?"

Dr. Kingman: "It was down to 2 sometime and then up to 3.6 without much change in the microscopic appearance of urinary sediment."

Dr. Bowman: "There are three reasons why this man could have nitrogen retention. (1) With hypertension of some standing he could have change in the kidney function. (2) Dehydration could result in concentration of the blood chemical constituents. (3) Because of vomiting or removal of chloride through the Levine tube, his blood chloride could be lowered sufficiently to interfere with the function of a normal kidney."

Dr. Philip Batchelder: "The first portable film shows the consolidation.

"This film shows the diffusely enlarged heart.

"This film is again when he was rather sick but does show two or three loops of small intestine, not very well shown."

Dr. Frank B. Cutts: "In regard to the emboli. As far as the cerebellar ones are concerned it must have originated in the left side of the heart. The one in the lung would have to originate from the right side so if this were explaining all the manifestations on an embolic manifestation there must be two sources of emboli."

Dr. B. Earl Clarke: Postmortem Findings. "In any case of circulatory failure, particularly if there is dilatation of the heart there may be thrombus formation in both sides of the heart, especially in the auricles. We have some additional information for you, but not much. This was one of those postmortems limited to opening up the surgical incision. We cannot answer anything about the organs above the diaphragm. Dr. Kingman was not allowed to see the operative sheet as that told about as much as the postmortem.

"We will start out with the intestine. Here is a portion of the small intestine. Here in the jejunum, you can see a distinct change in the color and this defect was present when the abdomen was opened. There is gangrene of the intestine with a large slough in the central portion. Needless to say the belly was full of both fecal material and inflammatory exudate. In the mesentery above the lesion were found three small arteries about 0.5 cm. in diameter and blocked with thrombus. There were two other small branches in this area. We have then occlusion of the branches of the mesenteric artery. There was no thrombus extending back into the portal vein. This, I think, explains all of his acute symptoms. The terminal event was peritonitis. I think we ought to take it for granted that the clinical evidence was right and that there was a myocardial infarction. I think Dr. Kingman has proposed a logical reason to suppose the occlusion of the mesenteric artery was embolic. There is nothing about the thrombus in the vessel that tells us whether it originated here. You can only do that in such instances as the large vessels of the lung where a coiled thrombus of smaller calibre must have originated elsewhere. In a small vessel like this there is no way to be certain. It seems reasonable to suppose that it is embolic. Now for the matter of the jaundice. Portal thrombosis was not found but there was very marked chronic passive congestion over all the abdominal organs. We have microscopic sections of the liver, spleen and kidneys and they are all congested. Chronic passive congestion itself might explain his jaundice but he had other things. We know he has infarcts in the intestine and the spleen and we think he had some in the lungs. We know those are supposed to produce hemorrhage. If an excessive amount

of pigment from the hemorrhage is delivered to a liver that is already damaged there will be an additional reason for jaundice. In the presence of a peritonitis we might also expect a so-called toxic jaundice. He had three or four things, anyone of which might be a cause of jaundice. A combination of causes seems logical."

Dr. Kingman's diagnosis:

1) Coronary Heart Disease.
2) Cerebral Embolus.
3) Pulmonary Embolus.
4) Mesenteric Embolus (Superior Mesenteric).
5) Mesenteric Thrombosis and Portal Thrombosis.
6) Passive Congestion of Liver.

Pathologic Diagnosis:

Occlusion of mesenteric artery (embolic).
Infarction and perforation of jejunum.
Peritonitis.

PROVIDENCE MEDICAL ASSOCIATION

A regular meeting of the Providence Medical Association was held at the Medical Library, Monday, March 2, 1942.

Dr. Frederick W. Ripley and Dr. Priscilla Sellman were elected to active membership.

The President announced the appointment of a committee of the Association to be known as the "Procurement and Assignment Committee" whose work will be to aid similar committees representing the State and First Corps Area in the task of checking the doctors of the community for military and civilian work during the war.

The committee named by the President was as follows:

Dennett L. Richardson, M.D., Chairman
Kalei K. Gregory, M.D.
James H. Fagan, M.D.
Robert H. Whitmarsh, M.D.
Jacob Greenstein, M.D.
Harmon P. B. Jordan, M.D.
Charles P. Fitzpatrick, M.D.
William O. Rice, M.D.
Ubaldo E. Zambarano, M.D.
Arthur H. Ruggles, M.D.
Henry E. Utter, M.D. (ex officio)

Dr. Peter Pineo Chase presented a case report on "Cancer Scroti".

Dr. Morgan Cutts was the first discusser in a symposium on "Hypertension". Dr. Cutts presented the Experimental Aspects of the subject.

Dr. Robert Baldridge next discussed the Surgical Treatment of Hypertension. Three cases were presented in some detail illustrating the good results which may be observed with this type of therapy.

The symposium was concluded by Dr. Clifton Leech who outlined the treatment with thiocyanates after discussing the Medical Aspects and commented upon their limitations.

The papers were discussed by Drs. Fulton, Burgess, Messinger, Goodman and Emery Porter.

The meeting adjourned at 10:40 P. M. Attendance 110.

FRANK B. CUTTS, M.D., *Secretary*

BOOK REVIEWS

DISEASES OF METABOLISM, Edited by Garfield G. Duncan, M.D., pp. 985, with 158 illustrations, 7 in color, and many charts and tables, cloth, W. B. Saunders Company, Philadelphia and London 1942.

Written for the purpose of bridging the gap between the practitioner and the investigative worker, this volume is the work of the following well-known clinicians and investigators; Walter Bauer, Hugh R. Butt, Abraham Cantarow, Tracy D. Cuttle, Garfield G. Duncan, Frank A. Evans, Ferdinand Fetter, Friedrich Klemperer, C. N. H. Long, Edward H. Mason, Louis H. Newburgh, John P. Peters, Tom D. Spies, Leandro M. Tocantins, and Abraham White. As a basis for the discussion of the individual metabolic diseases, sections on Carbohydrate, Fat, Protein, Mineral, and Water Metabolism form the first portion of the work, with an admirable approach to simplicity and completeness. The advance in modern knowledge in all these fields is well presented, and a sufficient discussion of basic chemical and physiological facts and methods is provided to afford the reader the necessary back-ground for sane clinical, application of the material presented.

The chapters on the individual metabolic diseases, including Diabetes Mellitus, Vitamin deficiencies, Gout, Obesity, and others, are of somewhat less uniform excellence, but are in all instances readable and informative, and constitute a very practical help in the handling of clinical cases.

Like most medical books dealing with subjects in which the rate of scientific progress is rapid, this work will have a relatively short useful life unless it is very frequently revised. As a book for the practitioner who wishes an authoritative reference work on this highly important and complex group of diseases, and as a source of basic facts upon which to build a sane evaluation of future advances in the field of Metabolism, this book cannot be too highly recommended.

ALEX M. BURGESS, JR., M.D.